

## SN 1987A: A unique laboratory for shock physics

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Supernova 1987A has given us an unprecedented view of the evolution of the explosion debris and its interaction with circumstellar matter. The outer supernova debris, now expanding with velocities  $\sim 8000$  km/s, encountered the relatively dense circumstellar ring formed by presupernova mass loss in the early 1990s. The shock interaction is manifested by UV-optical "hotspots", an expanding X-ray ring, an expanding ring of knotty non-thermal radio emission, and a ring of thermal IR emission from silicate dust. Recent ultraviolet observations of the emissions from the reverse shock and the ring with the HST/COS reveal new details about the shock interaction. Lyman alpha emission from the reverse shock is much stronger than H alpha and they have different emission morphologies, pointing to different emission mechanisms. The reverse shock was detected for the first time in C IV 1550. The N V to C IV brightness ratio indicates the N/C abundance ratio in the expanding debris is about 100X solar, about 3X N/C in the inner ring.

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